

SPECIFICATION

ACIDIC EMULSIFIED MAYONNAISE-LIKE FOOD

5 Technical Field

The present invention relates to an acidic emulsified mayonnaise-like food, and more specifically, an acidic emulsified mayonnaise-like food suppressed in flavor deterioration and viscosity reduction with time and improved in emulsion stability. Note that the term "acidic emulsified mayonnaise-like food" conceptually includes mayonnaise and a mayonnaise-type flavor seasoning. The term "mayonnaise" used herein is the one defined in the Japan Agricultural Standards. The term "mayonnaise-type flavor seasoning", although it is not defined in the Japanese Agricultural Standards, is a food product analogous to mayonnaise in respects of flavor, appearance, physical properties, and intended use. All of them fall into a category of a semi-solid dressing in accordance with the classification of dressings in the Japanese Agricultural Standards.

25 Background Art

An acidic emulsified mayonnaise-like food is

used for various types of cooking including salad dishes and loved by a wide variety of people. In the majority of cases, the flavor of such an acidic emulsified mayonnaise-like food is primarily due to edible fat and oil, egg, and edible vinegar. An acidic emulsified mayonnaise-like food using soybean protein in place of egg is disclosed in Japanese Patent Laid-Open No. 55-39725, whereas an acidic emulsified mayonnaise-like food using fermented milk in place of egg is disclosed in Japanese Patent Laid-Open No. 59-166059.

On the other hand, needs for food containing no cholesterol have recently increased for the health reason, and thus, attempts to prepare a mayonnaise-like food by using soybean protein as an emulsifying agent in place of egg have been so far made.

However, the acidic emulsified mayonnaise-like foods obtained even by the methods for manufacturing a mayonnaise-like food disclosed in the aforementioned publications are not free from phenomena such as degradation in flavor and reduction in viscosity with time if stored for a long period, inviting a decrease in shape retaining ability. Due to these phenomena, the commercial value of the food decreases. Furthermore, in such

an acidic emulsified mayonnaise-like food, the emulsion state thereof is sometimes destroyed by a temperature change in the ambient air, more specifically, due to excessive cooling caused by irregularity in temperature within a refrigerator. In this case, the food also loses much of its commercial value. An oily component is lower in a mayonnaise type flavor seasoning than mayonnaise. The content thus reduced is generally compensated by a starch or the like. In this way, consideration is taken to texture and shape retaining ability (e.g., Japanese Patent Laid-Open No.7-31414). However, such a product is not satisfactory in terms of deterioration of flavor with time. Accordingly, it has been desired to develop an acidic emulsified mayonnaise-like food suppressed in flavor deterioration and viscosity reduction with time, and having good emulsion stability and shape retaining ability.

Thus, an object of the present invention is to provide an acidic emulsified mayonnaise-like food suppressed in flavor deterioration and viscosity reduction with time and having good emulsion stability and shape retaining ability.

Disclosure of the Invention

The inventors of the present invention carried out an in-depth study. As a result, they found that the aforementioned object can be accomplished by
5 adding a specific esterified compound and a thickening polysaccharide and controlling the content of a protein to fall within a specific range.

The present invention has been accomplished based on the aforementioned finding. According to
10 the present invention, there is provided an acidic emulsified mayonnaise-like food containing an esterified compound composed of a starch or a hydrolysate thereof and an alkenylsuccinic acid, and a thickening polysaccharide, in which the
15 content of protein is less than 0.5% by mass.

Because of such a constitution, it is possible to obtain an acidic emulsified mayonnaise-like food suppressed in flavor deterioration and viscosity reduction with time and having good emulsion
20 stability even if temperature of the ambient air changes, thereby maintaining good shape retaining ability, and satisfactory texture due to good oral solubility.

An acidic emulsified mayonnaise-like food of
25 the present invention may further contain edible fat and oil, edible vinegar, salt and seasoning.

As the esterified compound, use may be made of an esterified compound composed of potato starch or a hydrolysate thereof and an alkenylsuccinic acid; or an esterified compound composed of potato starch or a hydrolysate thereof and an alkenylsuccinic acid in combination with an esterified compound composed of waxy cornstarch or a hydrolysate thereof and an alkenylsuccinic acid.

In the case where an esterified compound composed of potato starch or a hydrolysate thereof and an alkenylsuccinic acid is used in combination with an esterified compound composed of waxy cornstarch or a hydrolysate thereof and an alkenylsuccinic acid, the obtained acidic emulsified mayonnaise-like food is improved in flavor and texture (oral solubility); at the same time, smooth appearance of the acidic emulsified mayonnaise-like food immediately after manufacturing, can be maintained for a long time.

Also, the present invention provides a method of manufacturing an acidic emulsified mayonnaise-like food having a protein in a content of less than 0.5% by mass, comprising a step of emulsifying an aqueous phase portion, which contains an esterified compound composed of a starch or a hydrolysate thereof and an alkenylsuccinic acid, a thickening

polysaccharide, and substantially no protein, with an oily phase portion.

Best Mode for Carrying Out the Invention

5 An acidic emulsified mayonnaise-like food of the present invention will be explained below.

 In the present specification, the term "mayonnaise-like food" conceptually includes mayonnaise and a mayonnaise-type flavor seasoning.
10 Specific examples of such a mayonnaise-like food may include mayonnaise, salad dressing, tartar sauce, and other semi-solid dressing.

 An acidic emulsified mayonnaise-like food of the present invention comprises an esterified
15 compound composed of a starch or a hydrolysate thereof and an alkenylsuccinic acid and a thickening polysaccharide, in which the content of protein is less than 0.5% by mass of the total mass of the acidic emulsified mayonnaise-like food.

20 As an example of such a starch, there can be mentioned potato starch, tapioca starch, cornstarch, waxy cornstarch, and the like. In the acidic emulsified mayonnaise-like food of the present invention, hydrolysates of the aforementioned
25 starches may be used. The hydrolysates of the aforementioned starches may be obtained by any

method, for example, a conventional method. Of the starches, potato starch is preferably used. More preferably, potato starch may be used in combination with waxy cornstarch. When potato starch is used, 5 an acidic emulsified mayonnaise-like food improved in flavor and texture (oral solubility) can be obtained. When potato starch is used in combination with waxy cornstarch, an acidic emulsified mayonnaise-like food improved in flavor and texture 10 (oral solubility) can be obtained, and simultaneously, the smooth appearance of the acidic emulsified mayonnaise-like food immediately after manufacturing can be maintained for a long period. Note that the "smooth appearance" refers to an 15 appearance of glazy, glossy and smooth state of the surface of an acidic emulsified mayonnaise-like food pushed out from a plastic squeeze bottle.

The esterified compound is obtained by esterifying a starch or a hydrolysate thereof with 20 alkenylsuccinic acid. Such esterified compounds may be used singly or in an admixture of two or more types. As the esterified compound, it is preferable to use an esterified compound composed of potato starch or a hydrolysate thereof and an 25 alkenylsuccinic acid. It is more preferable to use an esterified compound composed of potato starch

or a hydrolysate thereof and an alkenylsuccinic acid in combination with an esterified compound composed of waxy cornstarch or a hydrolysate thereof and an alkenylsuccinic acid. A degree of substitution of ester groups of the esterified compound is preferably 0.005 to 0.020. When a degree of substitution is less than 0.005, emulsifiability is low, with the result that emulsification stability of the resultant mayonnaise-like food may decrease. On the other hand, when a degree of substitution exceeds 0.020, it is not suitable for use under the restriction (FAO/WHO Joint Expert Committee on Food Additives (JECFA)).

The term "degree of substitution" of an ester group refers the number of substituents (ester groups of an alkenylsuccinic acid) bound via an ester bond to a single glucose molecule, which is a constitution unit of a starch. For example, when a degree of substitution of ester groups of an esterified compound of a starch with octenylsuccinic acid is 0.015, 0.015 of substituents (ester groups of octenylsuccinic acid) are bound to a single glucose molecule of a starch via an ester bond. Degree of substitution of ester groups of an esterified compound of a starch or a hydrolysate thereof with an alkenylsuccinic acid can be measured

by the Smith method (1967) based on the saponification method (Genung & Mallatt, 1941). This method is performed by adding strong alkali to an esterified compound to generate an alkenylsuccinate and quantifying the amount of
5 alkali consumed there. As an example of the aforementioned alkenylsuccinic acid, there can be mentioned octenylsuccinic acid, decenyl succinic acid, dodecenyl succinic acid, tetradecenyl
10 succinic acid, hexadecenyl succinic acid, octadecenyl succinic acid, and the like.

An esterified compound composed of a starch or hydrolysate thereof and an alkenylsuccinic acid can be prepared by any method, for example, by a
15 method, which comprises blending a starch or a hydrolysate thereof and an alkenylsuccinic acid and carrying out an esterification reaction in the presence of an acidic or alkaline catalyst, under an inert gas atmosphere as needed, at a temperature
20 from room temperature to 200°C for 5 to 20 hours. The obtained esterified compound may be subjected to a purification treatment for removing acid, color, and odor as needed. The esterified compound thus obtained generally has two carboxyl groups: one is
25 a carboxyl group forming an ester with a starch or a hydrolysate thereof and the other carboxyl group

may be free or form a salt with sodium, potassium, ammonia and an amine.

An esterified compound preferably used in an acidic emulsified mayonnaise-like food of the present invention is the esterified compound of potato starch and octenylsuccinic acid in view of flavor and texture (oral solubility). To improve flavor and texture (oral solubility), and to maintain smooth appearance for a long period, it is more preferable to use the esterified compound of potato starch and octenylsuccinic acid in combination with an esterified compound of waxy cornstarch and octenylsuccinic acid.

Furthermore, for the reasons mentioned above, a degree of substitution of ester groups of the esterified compound of potato starch and octenylsuccinic acid or the esterified compound of waxy cornstarch and octenylsuccinic acid is preferably 0.005 to 0.020. As the esterified compound of potato starch and octenylsuccinic acid, a commercially available one may be used, for example, Trecomextwalb 02 (a degree of substitution of ester groups is 0.015 and obtained from potato starch as a raw material) manufactured by Oji Cornstarch Co., Ltd. may be used. Furthermore, as the esterified compound of waxy cornstarch and octenylsuccinic acid,

a commercially available one may be used, for example, Ncleamer 46 (a degree of substitution of ester groups is 0.020 and obtained from waxy cornstarch as a raw material) manufactured by Japan NSC may be used.

5 The content of such an esterified compound in the acidic emulsified mayonnaise-like food of the present invention is preferably 0.1 to 5.0% by mass, more preferably 1.0 to 2.5% by mass, and most preferably 1.2 to 2.2% by mass. When the content
10 of an esterified compound is less than 0.1% by mass, sufficient stability cannot be obtained; whereas the content is not less than 5.0% by mass, the texture (oral solubility) of the resultant acidic emulsified mayonnaise-like food may not be good.

15 When an esterified compound of potato starch and octenylsuccinic acid is used in combination with an esterified compound of waxy cornstarch and succinic acid, the mass ratio of the esterified compound of potato starch and octenylsuccinic acid
20 relative to the esterified compound of waxy cornstarch and succinic acid is preferably from 3:1 to 1:3, more preferably, from 2:1 to 1:2. If the mass ratio falls within the aforementioned range, the balance of long-term retaining between flavor,
25 texture (oral solubility) and smooth appearance improves.

As an example of the thickening polysaccharide to be used in an acidic emulsified mayonnaise-like food of the present invention, there can be mentioned carrageenan, locust bean, pectin, tamarind seed, guar gum, tragacanth gum, caprobean gum, gellan gum, xanthan gum, and the like. Of these polysaccharides for thickening, xanthan gum is preferably used in view of shape retaining ability, stable viscosity, and oral solubility. The polysaccharides for thickening may be used singly or in an admixture of two or more types. As the polysaccharides for thickening, commercially available ones may be used, for example, Eco gum GM manufactured by Dainippon Pharmaceutical Co., Ltd. may be used.

The content of a thickening polysaccharide in an acidic emulsified mayonnaise-like food of the present invention is preferably 0.01 to 2.5% by mass, more preferably 0.3 to 0.7% by mass, and most preferably, 0.4 to 0.6% by mass. When the content of a thickening polysaccharide is less than 0.01% by mass, the viscosity is so low that a mayonnaise-like viscosity may not be obtained. On the other hand, when the content is not less than 2.5% by mass, the viscosity of the resultant acidic emulsified mayonnaise-like food is so high that oral solubility deteriorates and suitability for cooking

decreases.

Although preferable contents of an esterified compound and a thickening polysaccharide in an acidic emulsified mayonnaise-like food of the present invention are as mentioned above, the mass ratio (ratio of an esterified compound to a thickening polysaccharide in terms of mass) is preferably from 2:1 to 10:1. When the mass ratio of an esterified compound to a thickening polysaccharide falls within the aforementioned range, the resultant acidic emulsified mayonnaise-like food has a good balance between the oral solubility and the shape retaining ability. Furthermore, the mass ratio of an esterified compound to a thickening polysaccharide is more preferably from 2:1 to 5:1, and most preferably, from 2.5:1 to 4.5:1.

An acidic emulsified mayonnaise-like food of the present invention may contain edible fat and oil, edible vinegar, salt and seasoning.

As an example of such an edible fat and oil, there can be mentioned soybean oil, rapeseed oil, high oleic rapeseed oil, corn oil, sesame seed oil, sesame salad oil, Japanese basil oil, linseed oil, peanut oil, safflower oil, high oleic safflower oil, sunflower oil, high oleic sunflower oil, cotton seed

oil, grape seed oil, macadamia nut oil, hazelnut oil, pumpkin seed oil, walnut oil, camellia oil, tea oil, perilla oil, borage oil, olive oil, rice bran oil, wheat germ oil, palm oil, palm kernel oil, 5 coconut oil, cacao butter, beef fat, lard, chicken fat, milk fat, fish oil, seal oil, algae oil, low saturated fats and oils improved from these, transesterification fats and oils obtained by exchanging ester groups between two or more types 10 of these oils, hydrogenated fats and oils, and fractionated fats and oils of these. These edible fats and oils may be used singly or in an admixture of two or more types.

The content of such an edible fat and oil in 15 the acidic emulsified mayonnaise-like food of the present invention is preferably 10 to 80% by mass, more preferably 50 to 75% by mass, and most preferably 50 to 65% by mass.

As an example of the edible vinegar, there can 20 be mentioned cereal vinegar, fruit vinegar, rice vinegar, apple vinegar, grape vinegar and the like. These vinegars may be used singly or in an admixture of two or more types. The content of vinegar in an acidic emulsified mayonnaise-like food of the 25 present invention may vary depending upon the acidity of the vinegar in terms of acetic acid and

preferably fall within the range of 0.3 to 1.5% by mass of the total mass of the acidic emulsified mayonnaise-like food.

As an example of the salt, there can be mentioned
5 refined salt, crude salt, solar salt, rock salt, mineral salt, potassium salt, and the like. These salts may be used singly or in an admixture of two or more types. The content of salt in an acidic emulsified mayonnaise-like food of the present
10 invention is preferably 0.5 to 4.0% by mass.

As an example of the seasoning, there can be mentioned seasonings such as consommé, soy sauce, ketchup, toubanjyan (spicy bean paste), amino acids, tenmenjyan (Chinese sweet seasoning), fermented
15 seasoning, acidulant, tasty seasoning (amino acids, nucleic acids, sodium glutamate), flavoring seasoning, and the like. The content of such a seasoning in an acidic emulsified mayonnaise-like food of the present invention may be one generally
20 used in an acidic emulsified mayonnaise-like food.

An acidic emulsified mayonnaise-like food of the present invention may contain raw materials usually used in an acidic emulsified mayonnaise-like food such as mayonnaise. As an example of such a
25 raw material, there can be mentioned saccharides such as sweeteners, hydrogenated starch syrup, and

white superior soft sugar; herbs and spices such as pepper, paprika, basil, dill, rosemary, cumin, tarragon, coriander, star anise, clove, cardamom, laurel, turmeric, fennel, mustard, thyme, sage, mace, all spice, celery seed, Japanese pepper, Japanese horseradish, capsicum, oregano, cayenne pepper, chili powder, and caper; cereals such as corn and pasta; nuts and seeds such as walnut, sesame seed, pine nut, and almond nut; beans such as Japanese fermented soybean paste, fermented soybeans, and soybean milk; sea food such as tuna, common scallop, dried bonito, sea urchin and salted cod roe; poultry, and whale meats such as bacon, canned beef, ham, and minced pork, beef and chicken; milks such as yogurt, cheese, cow milk, and cream, vegetables such as chive, pumpkin, Japanese basil, ginger, celery, Japanese radish, bamboo shoot, onion, tomato (including processed tomato), carrot, garlic, green onion, parsley, bell pepper, red bell pepper, yellow bell pepper, pickles, zarsai (Chinese pickles), horseradish, Zingiber mioga, scallion, green peace, and Japanese basil seed; seeds and juice of fruits such as pickled Japanese plum, Japanese plum, citrus kabosu, olive, grapefruit, citrus sudachi, pineapple, grape, mango, peach, citrus junos, lime, apple, lemon, orange, kiwi, Citrus natsudaidai,

hassaku orange, and passion fruit; mushrooms such as shiitake mushroom, mushroom, and wood ear; algae such as kelp, laver, hijiki, Tosaka laver, and seaweed, beverages such as refined sake, wine, sweet cooking rice wine, seaweed drink, plum wine; sauces such as chili sauce, tomato sauce, oyster sauce, and Worcester sauce; extracts such as natural extract, yeast extract, meat extract, sea food extract, and vegetable extract; protein hydrolysates; flavors; and water. These raw materials may be added appropriately depending upon desired flavor; however, care must be taken to the content of protein.

In an acidic emulsified mayonnaise-like food of the present invention, the content of protein is less than 0.5% by mass of the total mass of the acidic emulsified mayonnaise-like food, preferably less than 0.2% by mass, and more preferably substantially zero. When the protein content is not less than 0.5% by mass, the flavor and viscosity of the acidic emulsified mayonnaise-like food with time may decrease.

To control the protein content of an acidic emulsified mayonnaise-like food to fall within the aforementioned range, the mayonnaise-like food may be manufactured by using no egg and soybean protein,

although they are usually used as raw materials. When egg and soybean protein must be used, the amount of them to be contained in the acidic emulsified mayonnaise-like food obtained is limited so as to
5 be less than 0.5% by mass.

The content of protein in an acidic emulsified mayonnaise-like food may be measured by any means, for example, by the Kjeldahl method. Even though the content of protein is not measured by an
10 analytical method, it may be obtained through calculation based on the contents of raw materials of an acidic emulsified mayonnaise-like food. The Kjeldahl method is one that can obtain the amount of protein based on the nitrogen content of a sample.
15 When amino acids and nucleic acids such as glutamic acid, inosinic acid, and guanylic acid are contained in an acidic emulsified mayonnaise-like food, the content of protein in a sample is obtained by subtracting the contents of these amino acids and
20 nucleic acids.

The amount of amino acids and nucleic acids to be subtracted may be the amounts of them added during manufacturing of an acidic emulsified mayonnaise-like food or the amounts of them actually
25 contained in the acidic emulsified mayonnaise-like food obtained by a quantification means. In

practical analysis, nucleic acids such as inosinic acid and guanylic acid can be quantified by high-performance liquid chromatography and amino acids such as glutamic acid can be quantified by liquid chromatography. The amount of amino acids can be obtained by, for example, the "amino acid automatic analyzer" manufactured by JEOL. Ltd.

The acidic emulsified mayonnaise-like food of the present invention can be manufactured by a conventional method for manufacturing a mayonnaise-like food. Now, a method of manufacturing an acidic emulsified mayonnaise-like food of the present invention will be described below by way of an example, however, the method of manufacturing an acidic emulsified mayonnaise-like food of the present invention will not be limited by this example.

A method of manufacturing an acidic emulsified mayonnaise-like food of the present invention comprises a step of emulsifying an aqueous phase portion, which contains an esterified compound composed of a starch or a hydrolysate thereof and an alkenylsuccinic acid, a thickening polysaccharide, and substantially no protein, with an oily phase portion. According to the method of manufacturing an acidic emulsified mayonnaise-like

food of the present invention, since an aqueous phase portion containing no protein is used as a raw material, the protein content of the resultant acidic emulsified mayonnaise-like food is less than
5 0.5% by mass. Now, a specific example of manufacturing an acidic emulsified mayonnaise-like food of the present invention will be described.

To manufacture such an acidic emulsified mayonnaise-like food of the present invention, first
10 an aqueous phase portion is prepared by placing individual raw materials except edible fat and oil in a heatable stirring vessel and blending these materials by stirring them while heating the stirring vessel. The stirring may be performed
15 while heating if necessarily for dispersing, dissolving and sterilizing the raw materials. As long as these purposes can be attained, the conditions are not particularly limited. The stirring can be performed while heating under
20 pressure, reduced pressure and normal pressure and generally performed under normal pressure. The heating temperature is not particularly limited as long as raw materials can be dissolved and sterilized and usually performed at a temperature of 40 to 95°C,
25 preferably 60 to 95°C. Heating may not be performed if unnecessary.

Stirring may be performed under conditions as long as raw materials are dissolved under the condition. As a stirring means or method, use may be made of a propeller, homo mixer, blender, dispersion mill, paddle mixer, colloidal mill, continuous mixer, statistic mixer and ultrasonic wave. The rotation number and stirring time may not be particularly limited as long as raw materials can be uniformly dispersed. When heated, the aqueous phase portion is thereafter cooled to about normal temperature and combined with an edible fat and oil as an oily phase, thereby emulsifying them. The emulsification is generally performed under reduced pressure by use of a propeller, homo mixer, blender, dispersion mill, paddle mixer, colloidal mill, continuous mixer, or a statistic mixer. In this manner, the acidic emulsified mayonnaise-like food can be obtained.

20 Examples

The present invention will be described in more detail by way of examples, below. Such examples, however, are not to be construed as limiting in any way the scope of the present invention.

25 In Examples, an acidic emulsified mayonnaise-like food was evaluated by the following

method.

[Method for evaluating an acidic emulsified
mayonnaise-like food]

5 (1) Measurement of viscosity

A sample stored at a temperature of 20°C is
rotated twice at 2 rpm by a rotor No. 6, and then
the viscosity of the sample is measured by a BH-type
viscometer three times. An average value is used
10 as a value of viscosity.

Note that the viscosity of an acidic emulsified
mayonnaise-like food was measured immediately after
manufacturing and after storing at 20°C under 1000
lx for 1, 2, 3, 4, 5, and 7 weeks.

15

(2) Evaluation of flavor

Dishes having lettuce appropriately delivered
and dressed with an acidic emulsified
mayonnaise-like food were served to a panel of four
20 specialists. They ate the lettuce with the acidic
emulsified mayonnaise-like food and evaluated the
acidic emulsified mayonnaise food for flavor in
accordance with the following evaluation criteria.
Note that the obtained acidic emulsified
25 mayonnaise-like food was evaluated for flavor
immediately after manufacturing and after storing

in a dark place at 40°C and 20°C under 1000 lx for 1, 2, 3, 4, 5, and 7 weeks. Evaluation was performed by setting the flavor immediately after manufacturing at 5 points and by the average of scores of the four specialists of the panel.

5 points: Flavor is fresh and favorable comparable to that immediately after manufacturing.

4 points: Flavor slightly changes compared to that immediately after manufacturing but is still favorable.

3 points: Flavor slightly deteriorates compared to that immediately after manufacturing but is still acceptable.

2 points: Flavor deteriorates compared to that immediately after manufacturing and is bad.

1 point: Flavor significantly deteriorates compared to that immediately after manufacturing and is bad.

(3) Repeated refrigeration-thaw test

An acidic emulsified mayonnaise-like food is stored at -10°C for 8 hours and thereafter stored at 20°C for 16 hours. This cycle was repeated 15 times and thereafter the appearance was checked and the viscosity thereof was measured. Viscosity was measured in the same manner as described in the

paragraph (1).

(4) Evaluation of shape retaining ability

A plastic squeeze bottle having a star-shape
5 opening was charged with an acidic emulsified
mayonnaise-like food. When the mayonnaise-like
food was pushed out from the plastic squeeze bottle,
the shape of the mayonnaise-like food was evaluated
by visual observation based on the following
10 evaluation criteria.

G: Sharp star-shape stripe is observed.

M: Star-shape stripe is observed but somewhat
unclear.

P: No star-shape is observed.

15

(5) Evaluation of oral solubility

A panel of four specialists ate an acidic
emulsified mayonnaise-like food and evaluated it
for oral solubility. Evaluation was made based on
20 an average of four specialists.

G: The food melts fast in the mouth and texture
is good.

M: The food melts slowly in the mouth and texture
is bad.

25 P: The food is difficult to melt in the mouth
and the texture is bad.

(6) Evaluation of smooth appearance retaining ability

A so-called plastic squeeze bottle is charged with an acidic emulsified mayonnaise-like food and stored at a temperature of 5°C for a predetermined period. Thereafter, the mayonnaise-like food is pushed out from the plastic squeeze bottle and surface state thereof is visually observed.

E: Best condition where smooth appearance is retained.

G: Good condition where smooth appearance is slightly lost.

P: Not good condition where smooth appearance is lost.

Example 1

The acidic emulsified mayonnaise-like food was manufactured using the raw materials in accordance with the formulation shown in Table 1.

The acidic emulsified mayonnaise-like food was manufactured as follows.

The raw materials for an aqueous phase portion were placed in accordance with the formulation shown in Table 1 in a heatable tank with a stirrer and stirred by means of a paddle mixer at 100 rpm at room temperature for 10 minutes. Subsequently,

rapeseed oil serving as an oil phase was added and emulsified by rotating the paddle mixer at 100 rpm and a homo mixer at 5,500 rpm under reduced pressure for 10 minutes to obtain an acidic emulsified
5 mayonnaise-like food of starch emulsified mayonnaise-type. The viscosity of the obtained acidic emulsified mayonnaise-like food immediately after manufacturing was 198,800 mPa·s. The protein content of the obtained acidic emulsified
10 mayonnaise-like food was obtained by subtracting the amount of sodium glutamate added as a flavor seasoning from an analytical value of the Kjeldahl method. As a result, the protein content was 0% by mass. The obtained acidic emulsified
15 mayonnaise-like food was evaluated by the method described in the paragraph [Method for an acidic emulsified mayonnaise-like food]. The results are shown in Table 8 (Test (1) and (2)), Table 9 (test (3)), Table 10 (test (4) and (5)), and Table 11 (test
20 (6)).

Table 1

	Name of raw material	Content (% by mass)
Oil phase	Rapeseed oil(The Nisshin Oil Co., Ltd.)	57.0
Aqueous phase	Edible vinegar	7.0
	Spice	0.1
	Salt	2.6
	Esterified starch with octenylsuccinic acid	1.5
	Hydrogenated starch syrup	6.0
	Vegetable extract	0.4
	Xanthan gum	0.5
	Sodium glutamate	0.4
	Concentrated fruit juice	0.5
	Yeast extract	0.1
	Water	23.9
	Total	100.0

In Table 1, as the esterified starch with octenylsuccinic acid, Trecomextwalb 02 (trade name) manufactured by Oji Cornstarch Co., Ltd. (degree of substitution of ester groups is 0.015 and obtained from potato starch as a raw material) was used. As the hydrogenated starch syrup, SE600 (trade name) manufactured by Nikken Chemicals Co., Ltd. was used.

As the xanthan gum, Eco gum GM (trade name) manufactured by Dainippon Pharmaceutical Co., Ltd. was used.

Example 2

An acidic emulsified mayonnaise-like food of starch emulsified mayonnaise type was obtained in the same manner as in Example 1 except that the raw materials were used in accordance with the formulation shown in Table 2. The viscosity of the obtained acidic emulsified mayonnaise-like food immediately after manufacturing was 163,000 mPa·s. The protein content of the obtained acidic emulsified mayonnaise-like food, which was calculated from the contents of the raw materials, was 0% by mass. The obtained acidic emulsified mayonnaise-like food was evaluated by the method described in the paragraph [evaluation method for acidic emulsified mayonnaise-like food]. The results are shown in Table 8 (Test (1) and (2)), Table 9 (test (3)), Table 10 (test (4) and (5)), and Table 11 (test (6)).

Table 2

	Name of raw material	Content (% by mass)
Oil phase	Rapeseed oil (The Nisshin Oil Co. Ltd.)	57.0
Aqueous phase	Edible vinegar	7.0
	Spice	0.1
	Salt	2.6
	Esterified starch 1 with octenylsuccinic acid	0.7
	Esterified starch 2 with octenylsuccinic acid	0.7
	Hydrogenated starch syrup	6.0
	Vegetable extract	0.4
	Xanthan gum	0.5
	Sodium glutamate	0.4
	Concentrated fruit juice	0.5
	Yeast extract	0.1
	Water	24.0
	Total	100.0

In Table 2, as the esterified starch 1 with octenylsuccinic acid, Trecomextwalb 02 (trade name) manufactured by Oji Cornstarch Co., Ltd. (degree of substitution of ester groups is 0.015 and obtained from potato starch as a raw material) was used. As the esterified starch 2 with octenylsuccinic acid, N cleamer 46 (trade name) manufactured by Japan NSC (degree of substitution of ester groups is 0.020 and obtained from waxy cornstarch as a raw material) may be used. As the hydrogenated starch syrup, SE600 (trade name) manufactured by Nikken Chemicals Co.,

Ltd. was used. As the xanthan gum, Eco gum GM (trade name) manufactured by Dainippon Pharmaceutical Co., Ltd. was used.

5 Comparative Example 1

An acidic emulsified mayonnaise-like food of egg emulsified mayonnaise type was obtained in the same manner as in Example 1 except that the raw materials were used in accordance with the
10 formulation shown in Table 3. The viscosity of the obtained acidic emulsified mayonnaise-like food immediately after manufacturing was 198,000 mPa·s. The protein content of the obtained acidic emulsified mayonnaise-like food, which was
15 calculated from the contents of the raw materials, was 2.48% by mass. The obtained acidic emulsified mayonnaise-like food was evaluated by the method described in the paragraph [evaluation method for acidic emulsified mayonnaise-like food]. The
20 results are shown in Table 8 (Test (1) and (2)), Table 9 (test (3)), and Table 10 (test (4) and (5)).

Table 3

	Name of raw material	Content (% by mass)
Oil phase	Rapeseed oil(The Nisshin OilliO Group, Ltd.)	68.0
Aqueous phase	Yolk containing 10% salt	16.7
	Edible vinegar	5.5
	Salt	0.3
	Sodium glutamate	0.3
	Spice	0.1
	Water	9.1
	Total	100.0

In Table 3, as the yolk containing 10% salt,
one manufactured by Taiyo Kagaku Co., Ltd. was used.

5

Comparative Example 2

An acidic emulsified mayonnaise-like food of
soybean protein emulsified mayonnaise type was
obtained in the same manner as in Example 1 except
10 that the raw materials were used in accordance with
the formulation shown in Table 4. The viscosity of
the obtained acidic emulsified mayonnaise-like food
immediately after manufacturing was 188,000 mPa·s.
The protein content of the obtained acidic
15 emulsified mayonnaise-like food, which was
calculated from the contents of the raw materials,
was 1.47% by mass. The obtained acidic emulsified
mayonnaise-like food was evaluated by the method

described in the paragraph [evaluation method for acidic emulsified mayonnaise-like food]. The results are shown in Table 8 (Test (1) and (2)), Table 9 (test (3)), and Table 10 (test (4) and (5)).

5

Table 4

	Name of raw material	Content (% by mass)
Oil phase	Rapeseed oil(The Nisshin Oil Co. Ltd.)	55.0
Aqueous phase	Edible vinegar	7.5
	Salt	2.6
	Soybean protein	2.2
	Hydrogenated starch syrup	5.0
	Vegetable extract	1.2
	White superior soft sugar	1.0
	Xanthan gum	0.5
	Spice	0.3
	Sodium glutamate	0.4
	Yeast extract	0.1
	Water	24.2
	Total	100.0

In Table 4, as the soybean protein, Sorpie 1500 (trade name) manufactured Nisshin Cosmo Food Co., Ltd. was used. As the hydrogenated starch syrup, HS300 (trade name) manufactured by Hayashibara Co., Ltd. was used. As the xanthan gum, Eco gum GM (trade name) manufactured by Dainippon Pharmaceutical Co., Ltd. was used.

15

Comparative Example 3

An acidic emulsified mayonnaise-like food of starch + egg emulsified mayonnaise type was obtained in the same manner as in Example 1 except that the raw materials were used in accordance with the formulation shown in Table 5. The viscosity of the obtained acidic emulsified mayonnaise-like food immediately after manufacturing was 215,000 mPa.s. The protein content of the obtained acidic emulsified mayonnaise-like food, which was calculated from the contents of the raw materials, was 0.74% by mass. The obtained acidic emulsified mayonnaise-like food was evaluated by the method described in the paragraph [evaluation method for acidic emulsified mayonnaise-like food]. The results are shown in Table 8 (Test (1) and (2)), Table 9 (test (3)), and Table 10 (test (4) and (5)).

Table 5

	Name of raw material	Content (% by mass)
Oil phase	Rapeseed oil (The Nisshin Oil Group, Ltd.)	57.0
Aqueous phase	Edible vinegar	7.0
	Spice	0.1
	Salt	2.0
	Esterified starch with octenylsuccinic acid	1.0
	Yolk containing 10% salt	5.0
	Hydrogenated starch syrup	6.0
	Vegetable extract	0.4
	Xanthan gum	0.5
	Sodium glutamate	0.4
	Concentrated fruit juice	0.5
	Yeast extract	0.1
	Water	20.0
	Total	100.0

In Table 5, as the esterified starch with octenylsuccinic acid, Trecomextwalb 02 (trade name) manufactured by Oji Cornstarch Co., Ltd. (degree of substitution of ester groups is 0.015 and obtained from potato starch as a raw material) was used. As the yolk containing 10% salt, one manufactured by Taiyo Chemical Co., Ltd. was used. As the hydrogenated starch syrup, SE600 (trade name) manufactured by Nikken Chemicals Co., Ltd. was used. As the xanthan gum, Eco gum GM (trade name) manufactured by Dainippon Pharmaceutical Co., Ltd. was used.

Comparative Example 4

An acidic emulsified mayonnaise-like food of starch + soybean protein emulsified mayonnaise type was obtained in the same manner as in Example 1 except
5 that the raw materials were used in accordance with the formulation shown in Table 6. The viscosity of the obtained acidic emulsified mayonnaise-like food immediately after manufacturing was 200,000 mPa.s. The protein content of the obtained mayonnaise-like
10 food, which was calculated from the contents of the raw materials, was 0.54% by mass. The obtained acidic emulsified mayonnaise-like food was evaluated by the method described in the paragraph [evaluation method for acidic emulsified
15 mayonnaise-like food]. The results are shown in Table 8 (Test (1) and (2)), Table 9 (test (3)), and Table 10 (test (4) and (5)).

Table 6

	Name of raw material	Content (% by mass)
Oil phase	Rapeseed oil (The Nisshin Oil Co. Ltd.)	57.0
Aqueous phase	Edible vinegar	7.0
	Spice	0.1
	Salt	2.6
	Esterified starch with octenylsuccinic acid	1.0
	Soybean protein	0.8
	Hydrogenated starch syrup	6.0
	Vegetable extract	0.4
	Xanthan gum	0.5
	Sodium glutamate	0.4
	Concentrated fruit juice	0.5
	Yeast extract	0.1
	Water	23.6
	Total	100.0

In Table 6, as the esterified starch with octenylsuccinic acid, Trecomextwalb 02 (trade name) manufactured by Oji Cornstarch Co., Ltd. (degree of substitution of ester groups is 0.015 and obtained from potato starch as a raw material) was used. As the soybean protein, Sorpie 1500 (trade name) manufactured Nisshin Cosmo Food Co. Ltd. was used. As the hydrogenated starch syrup, SE600 (trade name) manufactured by Nikken Chemicals Co., Ltd. was used. As the xanthan gum, Eco gum GM (trade name) manufactured by Dainippon Pharmaceutical Co., Ltd.

was used.

Comparative Example 5

An acidic emulsified mayonnaise-like food
5 containing no thickening polysaccharide was
obtained in the same manner as in Example 1 except
that the raw materials are used in accordance with
the formulation shown in Table 7. The viscosity of
the obtained acidic emulsified mayonnaise-like food
10 immediately after manufacturing was 35,000 mPa·s,
which was not a satisfactory value. The acidic
emulsified mayonnaise-like food obtained in this
Comparative Example was thus evaluated by only tests
(4) and (5) of the method described above in the
15 paragraph [evaluation method for acidic emulsified
mayonnaise-like food]. The results are shown in
Table 10. The protein content of the obtained
mayonnaise-like food, which was calculated from the
contents of the raw materials, was 0% by mass.

Table 7

	Name of raw material	Content (% by mass)
Oil phase	Rapeseed oil (The Nisshin Oil Co. Ltd.)	57.0
Aqueous phase	Edible vinegar	7.0
	Spice	0.1
	Salt	2.6
	Esterified starch with octenylsuccinic acid	1.5
	Hydrogenated starch syrup	6.0
	Vegetable extract	0.4
	Sodium glutamate	0.4
	Concentrated fruit juice	0.5
	Yeast extract	0.1
	Water	24.4
	Total	100.0

In Table 7, as the esterified starch with octenylsuccinic acid, Trecomextwalb 02 (trade name) manufactured by Oji Cornstarch Co., Ltd. (degree of substitution of ester groups is 0.015 and obtained from potato starch as a raw material) was used. As the hydrogenated starch syrup, SE600 (trade name) manufactured by Nikken Chemicals Co., Ltd. was used.

Table 8

		ST	1wk	2wk	3wk
Example 1	Viscosity (mPa·s)	198,800	198,100	210,000	212,100
	Flavor score (40°C dark place)	5.0	4.8	4.4	4.3
	Flavor score (20°C 1000 lx)	5.0	4.8	4.6	4.5
Example 2	Viscosity (mPa·s)	163,000	163,000	164,000	165,000
	Flavor score (40°C dark place)	5.0	4.8	4.6	4.4
	Flavor score (20°C 1000 lx)	5.0	4.8	4.7	4.5
Comparative Example 1	Viscosity (mPa·s)	198,000	180,000	162,000	147,600
	Flavor score (40°C, dark place)	5.0	4.4	4.0	3.8
	Flavor score (20°C 1000 lx)	5.0	4.5	4.3	4.1
Comparative Example 2	Viscosity (mPa·s)	188,000	180,000	175,000	170,000
	Flavor score (40°C dark place)	5.0	4.3	4.3	4.1
	Flavor score (20°C 1000 lx)	5.0	4.6	4.4	4.3
Comparative Example 3	Viscosity (mPa·s)	215,000	212,000	210,000	205,000
	Flavor score (40°C dark place)	5.0	4.4	4.3	4.2
	Flavor score (20°C 1000 lx)	5.0	4.7	4.3	4.2
Comparative Example 4	Viscosity (mPa·s)	200,000	195,000	195,000	197,000
	Flavor score (40°C, dark place)	5.0	4.4	4.3	4.2
	Flavor score (20°C, 1000 lx)	5.0	4.6	4.5	4.1

		4wk	5wk	7wk
Example 1	Viscosity (mPa·s)	217,000	215,000	213,000
	Flavor score (40°C dark place)	4.1	4.1	4.0
	Flavor score (20°C 1000 lx)	4.4	4.3	4.2
Example 2	Viscosity (mPa·s)	164,500	164,000	164,000
	Flavor score (40°C dark place)	4.2	4.2	4.2
	Flavor score (20°C 1000 lx)	4.4	4.3	4.2
Comparative Example 1	Viscosity (mPa·s)	135,000	129,600	126,000
	Flavor score (40°C dark place)	3.5	3.3	3.2
	Flavor score (20°C 1000 lx)	3.8	3.5	3.4
Comparative Example 2	Viscosity (mPa·s)	167,000	160,000	152,000
	Flavor score (40°C dark place)	4.0	3.9	3.6
	Flavor score (20°C 1000 lx)	4.1	4.0	3.7
Comparative Example 3	Viscosity (mPa·s)	200,000	195,000	197,000
	Flavor score (40°C dark place)	4.0	3.8	3.6
	Flavor score (20°C 1000 lx)	4.2	3.9	3.8
Comparative Example 4	Viscosity (mPa·s)	195,000	190,000	188,000
	Flavor score (40°C dark place)	3.9	3.8	3.5
	Flavor score (20°C 1000 lx)	4.0	3.8	3.6

Table 9

	Viscosity before test (mPa·s)	Viscosity after test (mPa·s)	Appearance
Example 1	198,800	218,000	No separation of oil or water
Example 2	163,000	165,000	No separation of oil or water
Comparative Example 1	198,000	133,000	Oil was slightly separated on the upper surface
Comparative Example 2	188,000	150,000	Oil was slightly separated in the inner wall of the container and water was slightly separated on the upper surface
Comparative Example 3	215,000	195,000	Oil was slightly separated on the upper surface
Comparative Example 4	200,000	187,000	Oil was slightly separated in the inner wall of the container and water was slightly separated on the upper surface

Table 10

	Shape retaining ability	Oral solubilit y
Example 1	G	G
Example 2	G	G
Comparati ve Example 1	M	P
Comparati ve Example 2	M	M
Comparati ve Example 3	M	P
Comparati ve Example 4	M	M
Comparati ve Example 5	P	G

Table 11

	Immediately after manufacturing	1 month	2 month	3 month	4 month	5 month	7 month
Example 1	E	E	E	E	E	G	G
Example 2	E	E	E	E	E	E	E

5 The viscosities 7 weeks and immediately after manufacturing and their ratio (7 weeks vs. immediately after manufacturing) are shown in Table 12 from the measurement results of viscosity in Table 8.

Table 12

	Immediately after manufacturing	7 weeks later	Ratio of viscosity change
Example 1	198,800	213,000	1.07
Example 2	163,000	164,000	1.01
Comparati ve Example 1	198,000	126,000	0.64
Comparati ve Example 2	188,000	152,000	0.81
Comparati ve Example 3	215,000	197,000	0.92
Comparati ve Example 4	200,000	188,000	0.94

As is apparent from Table 8, the acidic emulsified mayonnaise-like foods obtained in Examples 1 and 2 maintained good flavor after they were stored for 7 weeks, demonstrating that they had good storage stability. In any one of the acidic emulsified mayonnaise-like foods obtained in Comparative Examples 1 to 4, flavor degradation was observed, failing to demonstrate that each of them was an mayonnaise-like food having sufficient storage stability.

As is apparent from Table 12, in the acidic emulsified mayonnaise-like foods obtained in Examples 1 and 2, no decrease in viscosity with time was observed even after they were stored for 7 weeks.

In any one of the acidic emulsified mayonnaise like food obtained in Comparative Examples 1 to 4, a decrease in viscosity with time was observed.

As is apparent from Table 9, in the acidic
5 emulsified mayonnaise-like foods obtained in Examples 1 and 2, no change in viscosity and no change in appearance were observed even in the case where a refrigeration-thaw cycle was repeatedly performed. In contrast, in all of the acidic emulsified
10 mayonnaise like food obtained in Comparative Examples 1 to 4, viscosity decreased by repeating the refrigeration-thaw cycle and appearance was not favorable.

As is apparent from Table 10, the acidic
15 emulsified mayonnaise-like foods obtained in Examples 1 and 2 were excellent in shape retaining ability and Oral solubility.

As is apparent from Table 11, in the acidic
20 emulsified mayonnaise-like foods obtained in Examples 1 and 2, smooth appearance was maintained. The food obtained in Example 2 exhibited the best results in long-term smooth appearance retaining ability.

25 Advantages of the Invention

As described in the forgoing, in an acidic

emulsified mayonnaise-like food of the present invention, it is possible to suppress flavor degradation and viscosity reduction with time. Therefore, the mayonnaise-like food is stable in
5 emulsion state and excellent in shape retaining ability.

According to the method of manufacturing an acidic emulsified mayonnaise-like food of the present invention, it is possible to suppress flavor
10 degradation and viscosity reduction with time. Therefore, it is possible to obtain a mayonnaise-like food stable in emulsion state and excellent in shape retaining ability.